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“Sustaining the
Resilient, Beautiful and Safe Cities
for a Better Quality of Life”

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“ **Sustaining the Resilient, Beautiful and Safe
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BARRIERS TO THE IMPLEMENTATION OF SOLAR PV TECHNOLOGY FOR TOURISM INDUSTRY IN MALAYSIA

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Abstract

Demand for fossil fuels in Malaysia is increasing due to the rapid development in the industrial and tourism sectors. Conventional energy used today is a non-renewable resource that will eventually run out. To fulfil rising conventional energy demand, the global energy sector has begun to shift its focus to renewable energy. Solar energy is one of the sources that has a bright future as an alternative to replace conventional energy in electricity generation. Solar Photovoltaics (PV) is seen as one of the positive alternatives in empowering green technology for the sake of environmental well-being. Malaysia should be able to generate electricity based on sunlight sources as we are endowed with an equatorial climate which is hot and humid all year round. However, this technology is not yet widely used, especially in the tourism sector. This study aims to identify and analyse the barriers and challenges faced by tourism industry stakeholders in the implementation of Solar Photovoltaics (PV) technology to form a sustainable tourism industry in Malaysia. This study used descriptive research approach. The result shows cost is the main difficulties for implement this technology. The findings also can help give a true picture of the obstacles faced by tourism industry stakeholders in the implementation of this solar technology in the tourism industry.

Keywords: *Barriers, Renewable Energy, Solar Photovoltaics, Technology, Tourism Industry*

INTRODUCTION

Renewable energy is not something new in Malaysia. It is seen as one of the positive alternatives in empowering green technology for the sake of environmental well-being by decreasing the combustion of fossil fuels like coal, petroleum, wood, and others for generating electrical energy. Solar Photovoltaics is one of the Renewable Energy (RE) alternative that has the ability to generate electricity while minimizing the need of traditional sources. Solar energy, in addition to being an effective approach in resolving environmental issues, it also has a positive impact on humans in terms of health and safety (Zakaria et al. 2019).

In Malaysia, the tourism industry is a sector that contribute high energy consumption in providing the greatest services and comfort to visitors. Malaysia's need for fossil fuels is rising due to fast development in the industrial and tourism sectors. The energy sector will face difficulties if the industry completely reliant on fossil fuels for electricity generation. To meet the need for power in the tourism sector, the Malaysian government is actively promoting the use of renewable energy in addition to conventional energy (Salehudin et al., 2011). According to Datuk Seri Nancy Shukri, Minister of Tourism, Arts, and Culture, the tourism industry appears to be reviving, since Malaysia has received approximately one million international

tourists since the country's border was opened (Berita Harian Online, 2022). Various campaigns and programs will be implemented to revive the Malaysia's tourism sector which seemed to be dead for the past 2 years following the Covid19 pandemic that hit the world. One of the government's efforts to revitalize the country's tourist sector is the release of Tourism Malaysia's Strategic and Marketing Plan 2022-2026 (Tourism Malaysia, 2021).

Achieving a higher level of life, a successful tourist strategy, and a low cost of power have all contributed to Malaysia's 138 (TWh) electricity consumption in 2016. In Southeast Asia, the use of coal increased in absolute terms (by 39% in 2013–16), as it was chosen over natural gas supplies for the production of electricity (APEC, 2019). Since the country's borders were opened on April 1, 2022 will witness the growth and vibrancy of Malaysia's tourism industry. In order to achieve business and environmental sustainability, green business practises are regarded as one of the most essentials factor. The tourism sector started creating green hotels as a result of increased environmental consciousness and customer concern about the environment by implementing Solar Photovoltaics (Huang et al., 2014). The aim of this research is to identify and analyse the barriers and limitations experienced by tourism industry stakeholders while implementing solar photovoltaics technology to form a sustainable tourism industry in Malaysia.

RESEARCH PROBLEM

The government has targeted two million foreign tourists to visit Malaysia as part of the 'Malaysia Truly Asia 2022' campaign. With the rising presence of international tourists' day by day, the country's tourism sector would definitely experience increased demand for power consumption. Until now, Malaysia is still entirely reliant on fossil fuels sources such as coal, petroleum, and natural gas for energy generation, notably in business and industry. Since Malaysia relies mostly on fossil fuels to produce the electrical power, problems with fossil fuel depletion might jeopardise the consistency of the supply (Ahmad et al., 2019).

Currently, we are now experiencing a continuous global energy crisis, a worsening environmental situation, and growing raw renewable energy (RE) material costs. The previous researcher is agreed that the tourism sector will providing benefits and profits to the country. However, due to the excessive use of natural resources, the growth of tourism facilities, and the large number of visitor arrivals, it also has the potential to harm the environment (Robinot and Giannelloni, 2010). Power outages were a severe problem in most high-capacity tourist areas. Power outages are unavoidable in the event of a power rationing scenario, as is the case in some Asian tourist cities having high electricity consumption such as Bali, Phuket and Mumbai (Hamid & Rashid,2012).

LITERATURE REVIEW

Renewable Practice in Tourism Industry

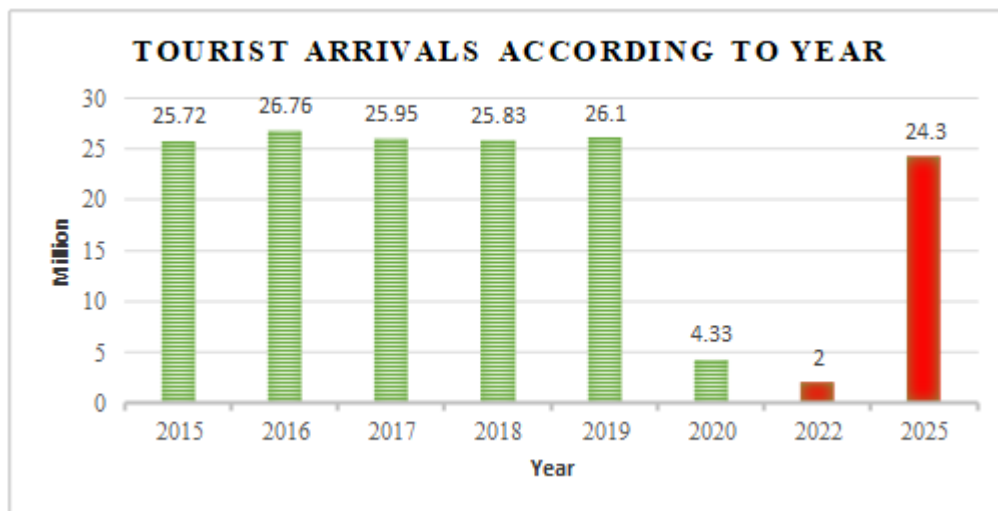
The burning of fossil fuels to generate power has a negative impact on the planet and the environment due to the release of carbon dioxide gas. In this sense, a more ecologically friendly method of generating power is required. The sun is a source of energy obtained daily and can be utilized with solar installations. Solar cells, which capture sunlight and transform it into electricity, are the foundation of solar photovoltaic systems (Kamaruzzaman et al., 2012).

Hotels and resorts were among the first structures to adapt to the influence of green hospitality in the mid-1990s (Melissen, F. et al, 2007). Malaysia's tourism industry is increasingly geared towards a sustainable tourism sector. The green approach is adapted in terms of energy, water and waste to prevent the tourism sector from contributing to a negative impact on the environment. (Yusof & Jamaludin, 2013). In order to provide customers with comfort, the industrial sector is the greatest contributor to environmental pollution. Therefore, initiatives to transition to renewable energy are considered as a driver for preserving

environmental harmony and well-being (Kirk, 1998). Due to the surge in Covid-19 infection in Malaysia, the nation's border was shut down starting on March 18, 2020, which resulted in a dramatic drop in foreign visitor arrivals. Global tourism had a massive loss of 74 percent in international visitor arrivals in 2020, a drop of 1 billion visitors from the year before, stated in World Tourism Organisation (UNWTO) data. (Tourism Malaysia, 2020) (Figure 1). However, 2022 is a very aggressive year where the Ministry of Tourism, Arts and Culture led by Datuk Seri Nancy Shukri is seen as very committed and creative in promoting Malaysia to the international level with the aim of reviving the country's tourism sector.

Figure 1

Tourist Arrivals According to Year



Sources: Tourism Malaysia Annual Report (2020)

As propose in Twelfth Malaysia Plan (RMK-12), numerous initiatives and programs will be implemented to boost the Malaysian tourism sector as well as promote and position Malaysia as a top tourist destination. MOTAC is the government body responsible for shaping and re-energizing momentum in the development of sustainable and inclusive tourism sector. By 2025, MOTAC hopes to welcome 24.3 million international visitors (MOTAC Official Portal, 2021) (Figure 1). The year 2022 shows a boom and a surge in high demand for global electricity with an increase of 6%. The world industrial sector reoperating and is the highest of electrical consumer after the sector was forced to cease operations for two years following the Covid-19 pandemic (IEA, 2022).

Solar, wind, biogas, biomass, and nuclear power are all potential sources of renewable energy. Solar photovoltaic-based energy production is regarded as the most ecologically beneficial and sustainable among renewable fuel-based power production methods (Salman, 2017). As reported by e-Buletin LADA (2021), Langkawi's tourist industry has also begun to focus on solar installation, particularly in government buildings, in an effort to lower electric bills while supporting the government's efforts to promote the use of renewable energy. Malaysia is a country near the equatorial region with a strategic geographic location for obtaining natural resources that are huge valuable in daily life. Due to its location, Malaysia is one of the countries that receive a high amount of sunlight throughout the year. So that, this country has more opportunities to develop solar energy technologies since it has access to infinite sunlight. According to Mekhilef et al. (2011) stated that Malaysia has a significant potential for developing the technology solar usage since the country receives adequate sun radiation on a daily basis due to the hot weather factor.

Chand et al., (2016) reported that the most significant factors to energy consumption in the tourist industry are continuous usage of electrical products such as air conditioning and electricity instability. Solar Photovoltaics has the potential to be a major catalyst to the growth of the renewable energy sector in the country. Although there are other renewable energy sources, such as hydropower and wind, Malaysia's tropical position on the equator offers the privilege of generating electricity from sunlight. Additionally, neither local, foreign companies nor any governmental authority have any control over these resources. Green building development, particularly hotels can be built if environmental education is adequately handled. Consumer behaviour in reducing waste, water consumption and even electricity also contribute in realizing this green building (Rahmah & Reynolds, 2016). The Energy Commission has also set a goal of reducing conventional power usage by 1000MW through the use of renewable energy.

Barriers in Implementing Solar PV in the Tourism Industry

Although Malaysia is located on the equator and is the most suitable area to adapt to the use of solar, unfortunately, we are sadly still far behind and have not mastered this technology compared to other Asian countries. Despite growing public knowledge of the benefits of using renewable energy, those sources of energy only met only 1.5% of global energy demand in 2006 (Abdelaziz et al, 2011).

Along with a lack of knowledge and awareness about renewable energy, Malaysia has challenges in expanding the utilization of solar photovoltaics due to the high cost of installation (Zakaria et al. 2019). Rijal et al., (2020) stated that consumers believe that the most significant impediments to adopting this technology are installation expenses as well as high cost of solar accessories. Fairouz et. al., (2018) also agreed on this point, stating that a lack of information and awareness of this technology, in addition to its expensive cost, is a key impediment to its widespread use in the industrial sector. Besides that, Previous academics have said that renewable energy is not accessible to people from all walks of life due to high purchasing cost causing them to be reluctant to use Solar Photovoltaics (PV) (Zografakis, et al., 2011; Borenstein, 2007).

Furthermore, a lack of understanding in applying this technology can lead to complications later on. Incorrect operation might occur from a lack of expertise, causing the system to malfunction. Users are less interested in utilising technology since they lack of awareness about the technology (Yusoff et al., 2015) and lack expertise about how to install and maintain it (Elnugoumi et al., 2012). Small and Medium Enterprises (SMEs) in the Malaysian tourism industry are confronted with the issue of rules and regulations in the goal of enhancing this environment (Parker et al., 2009 & Fayaz et al., 2011).

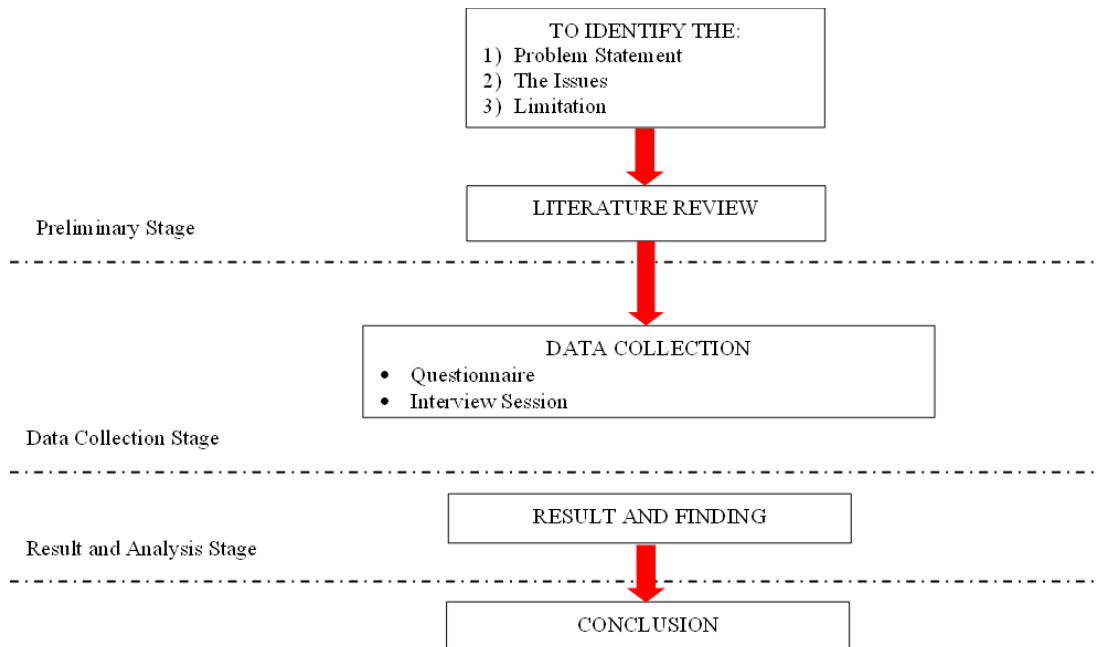
To some extent, the absence of powerful leadership (Kardooni et al., 2015) and substantial political power limits the growth of this renewable energy (Yusoff et al., 2015). This factor also supported by Florez and Ghazali (2020) stated that beside lack of consumer's awareness, lack of incentives from the government contributed to the failure in implementing this solar technology. Other than that, despite Malaysia's ability to receive significant amounts of solar radiation for solar, demand for this technology is still low due to the comfort of traditional use (Florez and Ghazali 2020; Abdullah et al. 2019).

RESEARCH METHOD

The descriptive research approach was used since the goal of the study is to identify impediments to implement Solar Photovoltaics (PV) technology. Descriptive statistics are used to explore the data collected and to summarize and describe those data (table, figure, frequency, percentage, mean and standard deviation). In this research, both quantitative and qualitative were used. We have conducted literature review, questionnaire and structured interview survey

as a methods of data collection. The methodology framework is followed in order to gain the aim of this study as shown in Figure 2.

Figure 2
Research Methodology Framework



Data collection and Analysis

The data collected through structured interview and questionnaire. A total of 200 questionnaires were distributed but only 170 responses were received which represents 85%. A set of questionnaires were randomly distributed to employees working in medium-scale tourism areas in Malaysia. This questionnaire will measure the barriers of Solar PV Implementation at Tourism Industry in Malaysia. There are 5 final variables used in order to identify through the literature review as shown in Table 1.

A pilot study was carried out with 5 (five) qualified person who are selected based on their position and expertise in Solar Industry. A greater knowledge and comprehension of Solar Photovoltaics (PV) technology and its limitations results from the interview session with these competent individuals.

Table 1
The Variable of Barriers

Variable	Source
Cost and Financing	Rijal et al., (2020)
	Zakaria et al. 2019)
	Fairoz et. al., (2018)
	Zografakis, et al., (2011)
	Borenstein, 2007)
Awareness and Knowledge	Fairoz et. al., (2018)
	Elnugoumi et al., (2012)
	(Yusoff et al., 2015)
	Florez and Ghazali (2020)

Political issue	Yusoff et al., (2015) (Kardooni et al., 2015) Florez and Ghazali (2020)
Act and Regulation	Parker et al., (2009) Fayaz et al., (2011)
Customer Demand	Florez and Ghazali (2020) Abdullah et al. (2019)

RESULTS

Profile of Respondents

The selection of 5 (five) competent person for interview session was based on their position and level of solar industry knowledge. Meanwhile there are 170 respondents for questionnaire. Based on gender, respondents consist of 38.2% are male and 61.8% are females. The academic qualification showed majority of the respondents have Diploma with 41.8% followed by Degree with 26.5%, SPM with 20.6%, Mater holder with 4.7% and PhD with 6.5%.

Barriers To the Implementation of Solar PV Technology for Tourism Industry in Malaysia

Out of all respondents, 80% of competent persons stated that medium and large-scale hotels do not utilize solar batteries due to high purchasing, placing and maintenance expenses. As a result, solar generated during peak hours from 10 a.m. to 3 p.m. is not extensively used due to low demand at that time. Visitors engage in a lot of outdoor activities during the time. Typically, excessive power usage occurs at night because hotel guests utilize electrical appliances. However, all of them are agreed cost is the main barrier to this implementation.

Solar Photovoltaics (PV) consumers are now constrained by land availability. The installation of these solar panels needs a huge space, as is well known, in order to generate power in a tourist region. As a result, installing solar panels is challenging and nearly impossible due to the issue of limited open area. They agree limited space contribute to this reduction in Solar PV used.

Tourist industry on the east coast is less interested in this technology due to insufficient sunshine. This is due to experiencing the monsoon season. Lack of exposure and expertise in solar technology has also resulted in the technology being less popular. Lastly, government support and help are obviously needed as the backbone of these large-scale solar users in terms of financial aid, area, and so on. The barriers chose by the respondent is identified through the interview session as illustrated in Table 2.

Table 2

Barriers of Solar PV Implementation at Tourism Industry in Malaysia has been identified through interview

Respondent	Cost	Limited Space	Consumer Demand	Expertise	Government Support
A	√	√	√	√	√
B	√	√	√		√
C	√	√	√	√	
D	√	√			√
E	√	√		√	

Table 3 shows the barriers results based on questionnaire questions. The main focus of the study focused on data from the questionnaire and interview. The discussion of the findings is to identify the barriers of Solar Photovoltaics (PV) implementation at tourism industry in Malaysia. The 5-variable included are the most popular impediments to the deployment of Solar Photovoltaics (PV) in Malaysian tourist industry identified through a literature review as illustrated in Table 3.

Based on the finding, majority of the respondents agreed that Cost and Financing is the main barriers of adopting Solar Photovoltaics in tourism industry in Malaysia with the mean values of 4.558 followed by Awareness and Knowledge barrier which shows the mean values of 4.247. Legal factors, Customer Demand and Act and Regulation also are the main barriers in implementing Solar PV in industry area with the mean values of 4.211, 4.135 and 4.141.

Table 3

Barriers of Solar Photovoltaics (PV) Implementation at Tourism Industry in Malaysia has been identified through questionnaire

Statement	SD	D	N	A	SA	Mean	SD
Customer Demand	1 (0.6%)	8 (4.7%)	25 (14.7%)	69 (40.6%)	67 (39.4%)	4.135	0.876
Awareness and Knowledge	2 (1.2%)	2 (1.2%)	33 (19.4%)	48 (28.2%)	85 (50%)	4.247	0.889
Act and Regulation	3 (1.8%)	9 (5.3%)	24 (14.1%)	59 (34.7%)	75 (44.1%)	4.141	0.968
Legal Factors	1 (0.6%)	10 (5.9%)	21 (12.4%)	58 (34.1%)	80 (47.1%)	4.211	0.917
Cost and Financing	1 (0.6%)	2 (1.2%)	18 (10.6%)	29 (17.1%)	120 (70.6%)	4.558	0.776
						4.258	0.74

Other than that, Table 4 represent the percentage and ranking for the barriers of Solar Photovoltaics (PV) Implementation at Tourism Industry in Malaysia. Based on the findings, majority of the respondents chose the Cost and Financing as the first choice in implementing the technology. The barrier that holds the second rank is Awareness and Knowledge followed by Legal Factor which ranked 3rd. Act and Regulation and Customer Demand are the barriers that occupy the 4th and 5th rank.

Table 4

Ranking of Barriers Chose by Respondents

Statement	Rank
Customer Demand	5
Awareness and Knowledge	2
Act and Regulation	4
Legal Factors	3
Cost and Financing	1

CONCLUSION

Solar photovoltaics is not a new technology in the globe or the Malaysian industry. This renewable energy source has the potential to reduce the combustion of fossil fuels in the power generation. Since they are the biggest consumers of power in Malaysia, tourism destinations

are seen to be the industry most suited for adopting this technology. Furthermore, due to its location on the equator, Malaysia receives a lot of sunshine for power generation. However, this technique is still not widely used. This method is only used in a few areas to generate power. The study's findings found various impediments to the deployment of Solar Photovoltaics (PV) in tourism industry. High pricing, as well as a lack of understanding and awareness of Solar Photovoltaics (PV) technology, are made it almost impossible for customers. It can be said, Malaysia's sustainable tourism business is expanding, and we believe it has a good future. There are several areas that can be conducted by other researchers in the future such as consider the similar research of barriers of Solar Photovoltaics (PV) implementation on Small and Medium Scale Enterprises in the Tourism Industry in Malaysia. Solar Photovoltaics (PV) should be implemented widely in Malaysia whether it is for small or big area as it will helps to reduce the traditional electrical usage.

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Tarikh : 20 Januari 2023

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Tuan,

**PERMOHONAN KELULUSAN MEMUAT NAIK PENERBITAN UiTM CAWANGAN PERAK
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Kelulusan daripada pihak tuan dalam perkara ini amat dihargai.

Sekian, terima kasih.

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Saya yang menjalankan amanah,

SITI BASRIYAH SHAIK BAHARUDIN
Timbalan Ketua Pustakawan

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27.1.2023

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